

UNIT
1

Forces and Motion: Dynamics



OVERALL EXPECTATIONS

ANALYZE, predict, and explain the motion of selected objects in vertical, horizontal, and inclined planes.

INVESTIGATE, represent, and analyze motion and forces in linear, projectile, and circular motion.

RELATE your understanding of dynamics to the development and use of motion technologies.

UNIT CONTENTS

CHAPTER 1 Fundamentals of Dynamics

CHAPTER 2 Dynamics in Two Dimensions

CHAPTER 3 Planetary and Satellite Dynamics



Spectators are mesmerized by trapeze artists making perfectly timed releases, gliding through graceful arcs, and intersecting the paths of their partners. An error in timing and a graceful arc could become a trajectory of panic. Trapeze artists know that tiny differences in height, velocity, and timing are critical. Swinging from a trapeze, the performer forces his body from its natural straight-line path. Gliding freely through the air, he is subject only to gravity. Then, the outstretched hands of his partner make contact, and the performer is acutely aware of the forces that change his speed and direction.

In this unit, you will explore the relationship between motion and the forces that cause it and investigate how different perspectives of the same motion are related. You will learn how to analyze forces and motion, not only in a straight line, but also in circular paths, in parabolic trajectories, and on inclined surfaces. You will discover how the motion of planets and satellites is caused, described, and analyzed.

UNIT PROJECT PREP

Refer to pages 126–127 before beginning this unit. In the unit project, you will design and build a working catapult to launch small objects through the air.

- What launching devices have you used, watched, or read about? How do they develop and control the force needed to propel an object?
- What projectiles have you launched? How do you direct their flight so that they reach a maximum height or stay in the air for the longest possible time?